

Acanthatrium oregonense and *A. oligacanthum* (Digenea: Lecithodendriidae: Lecithodendriinae) from the Big Brown Bat in Oregon

CATHERINE C. LEADABRAND

Harold W. Manter Laboratory and School of Biological Sciences, University of Nebraska–Lincoln,
Lincoln, Nebraska 68588-0514

ABSTRACT: *Acanthatrium oregonense* Macy, 1939, is reported from the big brown bat, *Eptesicus fuscus bernardinus* Rhoads, a new host record. *Acanthatrium oligacanthum* Cheng, 1957, is reported from the same host species and for the first time from Oregon, where it is the only *Acanthatrium* species with short (4–5 μ m) atrial spines. Measurements for the Oregon specimens overlap those of previously reported *A. oligacanthum* specimens but extend the upper limits of the ranges for most characters; the species is redescribed. The morphological variation may reflect geographic separation of populations of *A. oligacanthum*.

KEY WORDS: *Acanthatrium oligacanthum*, *Acanthatrium oregonense*, *Eptesicus fuscus*, infraspecific variation.

Within the subfamily Lecithodendriinae, only representatives of *Mesothatrium* Skarbilovich, 1948, and *Acanthatrium* Faust, 1919, possess a spined genital atrium. In *Mesothatrium* the vitellaria are posttesticular; in *Acanthatrium* they are pretesticular. Historically, the validity of various species of *Acanthatrium* has been debated. Dubois (1961) recognized 10 valid species and divided them into 2 subgenera, *Paracanthatrium* Dubois, 1961, and *Acanthatrium*. *Paracanthatrium*, distinguished by a preacetabular ovary, contained the sole species, *A. (P.) sphaerula* (Looss, 1896) Faust, 1919. *Acanthatrium*, characterized by a para- or postacetabular ovary, contained the remaining 9 species. Authors subsequent to Dubois (1961) seldom have mentioned the subgenera. Lotz and Font (1983) rejected Dubois' (1961) synonymy of *A. pipistrelli* Macy, 1940, with *A. eptesici* Alicata, 1932; otherwise, Dubois' (1961) revisions have been unchallenged and are the taxonomic foundation for this study.

Since 1961, 16 species of *Acanthatrium* (*Acanthatrium*) have been described. The 27 species of the genus have been reported at various localities worldwide, primarily from chiropterans, and they are distinguished by the size, distribution, and number of atrial spines. Within the Western Hemisphere only 3 species have been reported west of the Rocky Mountains: *A. eptesici*, *A. nycteridis* Faust, 1919, and *A. oregonense* Macy, 1939.

Materials and Methods

Sixty-six ovigerous specimens of *Acanthatrium* sp. were collected 5 January 1952 from the small intestine of a single big brown bat, *Eptesicus fuscus bernardinus*

Rhoads, at Hubbard, Marion County, Oregon, by Ralph W. Macy. The specimens were fixed in Gilson's fluid, stained in hematoxylin, and counterstained with fast green, mounted whole in CMCP (General Biological Supply House), and donated in 1986 to the Harold W. Manter Laboratory, Division of Parasitology, University of Nebraska State Museum, Lincoln (HWML Nos. 23413 and 33437). Observations were made using standard light microscopy and Nomarski differential interference contrast. Figures were drawn with the aid of a drawing tube. Measurements are stated in micrometers. Two specimens temporarily were dismantled for further flattening to enhance viewing of the atrial spines; 5 specimens were dismantled, sectioned sagittally at 5 μ m, stained with Masson's trichrome stain, and mounted in Canada balsam.

The following specimens were studied: *A. beuschleini* Cheng, 1959 (paratype, USNM No. 38388), *A. eptesici* (paratype, USNM No. 30137), *A. jonesi* Sogandares-Bernal, 1956 (holotype, USNM No. 37255), *A. microacanthum* Macy, 1940 (paratype, HWML No. 20682), *A. oligacanthum* (paratype, USNM No. 38174), *A. oregonense* (paratypes HWML Nos. 23198, 23207, and additional specimens HWML No. 23300), and *A. sogandaresi* Coil and Kuntz, 1956 (paratype, USNM No. 38279).

Results

Two of the 66 specimens in the collection were identified as *Acanthatrium oregonense*, which is distinguished by the presence of more than 50 moderately sized (10–15 μ m) atrial spines in a long, crescentic arrangement (Macy, 1939). The identification establishes *Eptesicus fuscus* as a new host for *A. oregonense*. The remaining specimens were identified as *A. oligacanthum*, which has a short row of approximately 10 atrial spines 4–5 μ m in length.

Whereas the atrial spine length, number, and arrangement are virtually identical between the

Table 1. Summary of specimen data available for *Acanthatrium oligacanthum*.

	<i>A. oligacanthum</i> syn. <i>A. beuschleini</i> (from Dubois, 1961)*	<i>A. oligacanthum</i> (present study)	<i>A. oligacanthum</i> (combined)
Body			
Shape	oval to pyriform	oval	oval to pyriform
Size	180–490/160–320	290–972/210–544	180–972/160–544
Oral sucker	40–84/50–89	56–98/44–106	40–98/44–106
Acetabulum	50–67/50–60†	40–76/46–88	40–76/46–88
Pharynx (diam.)	14–40	23–65	14–65
Esophagus (length)	10–30	16–159	10–159
Prostate mass	20–71/40–75	44–320/76–240	20–320/40–240
Testes			
Position	slightly preacetabular	slightly preacetabular	slightly preacetabular
Size	32–108/31–98†	49–185/54–124	32–185/31–124
Ovary			
Position	submedian, postacetabular	posteromed. to rt. testis	posteromed. to rt. testis
Size	34–88/22–65†	43–148/51–144	32–148/22–144
Atrial spines			
Number	approx. 10	approx. 10	approx. 10
Length	4–5	4–5	4–5
Position	on anterior border of atrial diverticle	along inner ventral surface of atrium	along inner ventral surface of atrium
Arrangement	in a parallel manner, directed dorsad	arranged parallel in a short row, directed dorsad	in a parallel manner, directed dorsad
Vitellaria extent	from level of pharynx to anterior borders of testes	prececal, pretesticular, extending to level of pharynx	prececal, pretesticular, extending to level of pharynx
Eggs	29–33/18–20 (on the type)	22–36/12–18	22–36/12–20
Hosts	<i>Eptesicus fuscus fuscus</i>	<i>Eptesicus fuscus bernardinus</i>	<i>Eptesicus fuscus fuscus</i> , <i>Eptesicus fuscus bernardinus</i>
Geographic distribution	U.S.: Virginia, Wisconsin	U.S.: Oregon	U.S.: Oregon, Virginia, Wisconsin

* Dubois (1961) reviewed type specimens and made certain corrections in measurements provided by Cheng (1957, 1959).
† Measurements reported in Dubois (1961) have been corrected.

Oregon specimens and previously reported *A. oligacanthum* specimens, certain morphological traits vary substantially, necessitating an expansion of the earlier species description. The following redescription of *A. oligacanthum* is a composite of specimen data obtained from Cheng (1957, 1959), Dubois (1961), and the present study.

***Acanthatrium oligacanthum* Cheng, 1957
(Table 1, Figs. 1–3)**

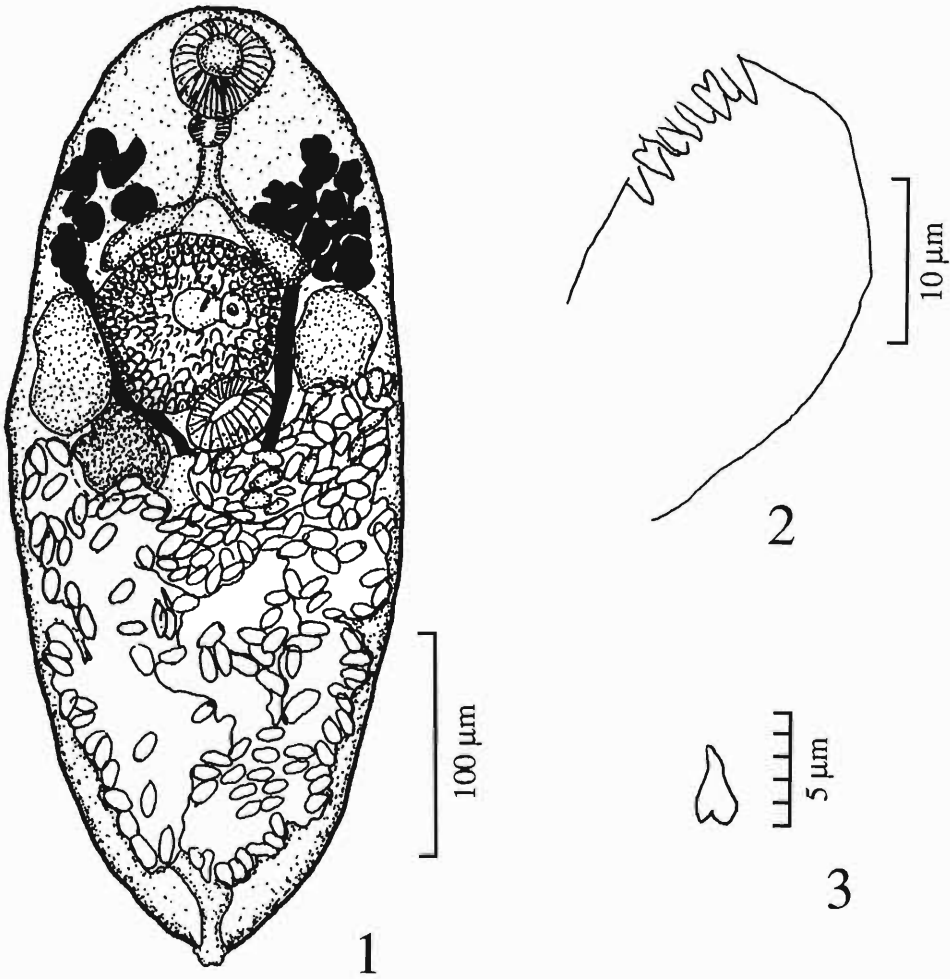
SYNONYM: *Acanthatrium beuschleini* Cheng, 1959.

HOSTS AND LOCALITIES: *Eptesicus fuscus fuscus* Beauvois in Albemarle and Russell counties, Virginia, and Eau Claire County, Wisconsin; *E. fuscus bernardinus* Rhoads in Marion County, Oregon.

SITE OF INFECTION: Small intestine.

REDESCRIPTION: With the characters of Lecithodendriidae, Lecithodendriinae. Body ovoid to pyriform, 180–972 long by 160–544 wide.

Tegumental spines not visible. Oral sucker subterminal, 40–98 long by 44–106 wide. Acetabulum mesiad and equatorial or immediately pre-equatorial, 40–76 long by 46–88 wide. Sucker width ratio 1:0.69–1.28. Prepharynx absent. Pharynx 14–65 in diameter. Esophagus length variable, attaining maximum of 159 in relaxed specimens; bifurcation up to 1/5 of body length from anterior end; ceca short and widely divergent, confined to anterior third of the body. Testes 2, more or less ovoid, anterolateral to acetabulum, near margins of body; long axis usually parallel to midline; right testis 40–185 long by 40–122 wide; left testis 32–161 long by 31–124 wide. Two vasa efferentia arising from respective anterior margins of testes and uniting medially to form vas deferens. Vas deferens entering indistinct seminal vesicle leading into thicker walled ejaculatory duct. Prostate mass spheroid to ovoid, 20–320 long by 40–240 wide, equal to or greater than size of acetabulum and testes, intertesticular, overlapping acetabulum posteriorly and bor-



Figures 1–3. *Acanthatrium oligacanthum* specimen from Oregon. 1. Adult, ventral view. 2. Genital atrium and atrial spines, lateral view. 3. Atrial spine, lateral view.

dered anteriorly by ceca; genital atrium ovoid, median, armed with approximately 10 spines; genital pore muscular, submedian, and ventral to prostate mass. Atrial spines 4–5 long, cuneiform; arranged in short row along inner, ventral surface of atrium and directed dorsad. Ovary ovoid or somewhat irregular, posteromedial and dorsal to right testis, 32–148 long by 22–144 wide. Vitelline clusters paired, symmetrical, prececal, pretesticular, composed of several small to medium, nondendritic follicles, reaching level of pharynx; vitelline ducts extending from each cluster posterior and mesiad, joining immediately posterior to acetabulum. Mehlis' gland irregularly ovoid, immediately postacetabular. Oötype not observed. Laurer's canal not visible.

Uterine loops broad, filling most of hindbody and reaching posterior borders of testes; metra-term weakly muscular, with proximal sphincter, extending along ventral surface of prostate mass to atrium. Uncollapsed eggs operculate, amber, numerous, 22–36 long by 12–20 wide. Excretory pore terminal, stem of excretory vesicle short; extent of vesicle obscured by uterus.

The Oregon specimens provide the upper limits of the ranges for all but 1 morphometric trait, egg width, and differ from previously reported *A. oligacanthum* most prominently in the increased width of the prostate mass relative to the testes and acetabulum (Table 1). In individual Oregon specimens, the prostate mass width averages approximately twice the testes and ace-

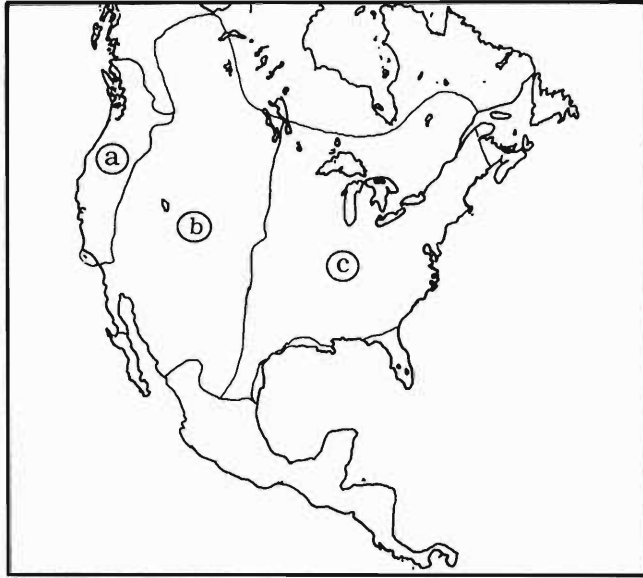


Figure 4. Geographical distribution of three *Eptesicus fuscus* subspecies (from Hall, 1981). a. *E. fuscus bernardinus*. b. *E. fuscus pallidus*. c. *E. fuscus fuscus*.

tabulum widths, whereas in previously reported specimens these same measurements are approximately equal.

Discussion

In addition to *Acanthatrium oligacanthum*, 2 other New World species possess very short ($< 10 \mu\text{m}$) atrial spines: *A. microcanthum* and *A. molossidis* Martin, 1934. *Acanthatrium oligacanthum* differs from *A. microcanthum* in having only 10 spines; Dubois (1961) counted 70 in *A. microcanthum*. No specimen of *A. molossidis* could be obtained, but descriptions by Martin (1934) and Macy (1940) reveal several differences from *A. oligacanthum*. Although both species possess few, short atrial spines, the tegument of *A. molossidis*, unlike that of *A. oligacanthum*, is spined throughout its anterior third (Macy, 1940). Other differences include a more spheroid body shape, vitellaria extending more anteriorly, and the genital atrium placed near the acetabulum. In addition, *A. molossidis* was reported from a different host, *Molossus sinaloae* Allen, and locality, Honduras.

The Oregon *A. oligacanthum* specimens reveal infraspecific variation, most notably in regard to the increased size of the prostate mass as compared with earlier described specimens. Because the Oregon worms were recovered from a single

bat, it is possible that similar morphological variation might be observed within this locality if worms from additional hosts were examined. Nonetheless, given (a) the mixed infection (*A. oligacanthum* and *A. oregonense*) and (b) the heavy infection of 64 specimens at various stages of maturity, it is doubtful that the bat obtained all metacercariae from a single insect.

Alternatively, the differences may reflect geographic separation of populations of *A. oligacanthum*. The Oregon specimens were recovered more than 1,500 miles from the nearest known *A. oligacanthum* locality. The definitive host species, *Eptesicus fuscus*, occurs throughout the United States but is divided into 11 subspecies that are nonmigratory (Barbour and Davis, 1969). The geographical distributions of 3 subspecies are shown in Figure 4. Comparison of the parasite and host species distributions indicates a correspondence of the Oregon and eastern *A. oligacanthum* populations to those of *E. fuscus bernardinus* and *E. fuscus fuscus*, respectively. The distribution of another subspecies, *E. fuscus pallidus*, corresponds roughly to the gap in the parasite distribution. Thus, the information to date suggests that the Oregon *A. oligacanthum* population is separated from other populations not only by space but also by host subspecies. Further work is necessary in 2 areas. First, collection of

additional *A. oligacanthum* within its known distribution is needed to evaluate the extent of morphological variation within populations in the eastern and western portions of the range. Second, sufficient *Eptesicus fuscus pallidus* individuals from the midwestern United States must be examined in order to determine if the *A. oligacanthum* distribution is indeed disjunct.

There are now 4 *Acanthatrium* species reported from the Pacific coast of North America: *A. eptesici*, *A. nycteridis*, *A. oligacanthum*, and *A. oregonense*. Of these species, only *A. oligacanthum* possesses very few and short atrial spines.

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